

Serum Procalcitonin Level and Comorbidity in Covid-19 Patients in UAE

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Abstract

Background: Most COVID-19 patients experience a mild form of the disease, but there is a certain percentage of patients who progress to a very severe disease state that requires intensive care and invasive ventilation. In order to ensure better patient management and improved outcomes, early identification of patients who may be at a higher risk of severe infection can play an important role. The aim of this study was to assess the association between the mean procalcitonin (PCT) level and comorbidity in hospitalized patients with COVID-19.

Methods and Results: A total of 231 COVID-19-positive patients aged between 20 and 82 years (170[73.6 %] males and 61[26.4%] females) were included in this study. Serum PCT was accessed by procalcitonin assay using the Beckman Coulter UniCel DxI 800 instrument. All patients were classified into 5 groups according to age: 20-29 years - 20(8.7%), 30-39 years - 47(20.3%), 40-49 years - 72(31.2%), 50-59 years - 48(20.8%) and >60years - 44(19.0%). Eighty-seven (37.7%) patients had no chronic disease, while 144(62.3%) had comorbidities: hypertension (37[16.0%]), diabetes mellitus (44[19.0%]), a combination of diabetes mellitus with hypertension (32[13.9%]), asthma (6[2.6%]), hyperlipidemia (4[1.7%]), renal disease (1[0.4%]), and COPD (1[0.4%]). COVID-19 patients with diabetes in combination with hypertension had a statistically greater PCT level than COVID-19 patients without comorbidities ($P=0.0273$). However, there were no statistically significant differences in the mean PCT levels between other comorbidities. There were no statistically significant differences in the mean PCT level between different age categories ($P=0.7390$). The serum PCT measurement could evaluate the prognosis of the disease in some COVID-19 patients. (International Journal of Biomedicine. 2022;12(4):627-630.).

Keywords: procalcitonin • COVID-19 • comorbidity • diabetes mellitus • hypertension

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Introduction

Globally, as of 28 September 2022, there have been more than 613 million confirmed cases of COVID-19 reported to WHO.⁽¹⁾ Most patients experience a mild form of the disease, but there is a certain percentage of patients who progress to a very severe disease state that requires intensive care and invasive ventilation.^(2,3) In order to ensure better patient management and improved outcomes, early identification of

patients who may be at a higher risk of severe infection can play an important role.⁽⁴⁾ Many studies have shown a positive correlation between increased serum procalcitonin (PCT) levels and COVID-19 severity.⁽⁵⁻⁷⁾ Circulating PCT levels are commonly within the normal range in COVID-19 patients, as expected for a viral infection. However, increased levels have been associated with a 5-fold higher risk of evolution towards severe disease.⁽⁸⁾ It is thought that COVID-19 progresses more quickly and severely in those with underlying medical disorders or comorbidities, frequently ending in death.⁽⁹⁾ The aim of this study was to assess the association between the mean PCT level and comorbidity in COVID-19 hospitalized patients.

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Materials and Methods

This is a cross-sectional study, conducted in Thumbay Hospital, Ajman, UAE, from January 2021 to October 2021. A total of 231 COVID-19-positive patients aged between 20 and 82 years (170[73.6%] males and 61[26.4%] females) were included in this study. Serum PCT was accessed by procalcitonin assay using the Beckman Coulter UniCel DxI 800 instrument. The Access PCT assay is a sequential two-step immunoenzymatic (sandwich) assay. The validation procedure was done according to CAP and CLIA for precision, accuracy, and linearity. A level of 0.5 µg/L was used as the upper limit to help determine the probability of bacterial infection, along with clinical judgement of a bacterial infection.⁽¹⁰⁾

Statistical analysis was performed using the Statistica 8.0 software package (StatSoft Inc, USA). Baseline characteristics were summarized as frequencies and percentages for categorical variables and as mean±SD for continuous variables. Inter-group comparisons were performed using Student's t-test. Multiple comparisons were performed with one-way ANOVA. Group comparisons with respect to categorical variables are performed using chi-square test. A probability value of $P < 0.05$ was considered statistically significant.

The study protocol was reviewed and approved by the Ethics Committee of Gulf Medical University. All participants provided written informed consent.

Results

This study analyzed 231 SARS-CoV-2 infected patients admitted to the hospital, including 121 mild COVID-19 patients, 59 moderate COVID-19 patients, and 51 severe COVID-19 patients. All patients were classified into 5 groups according to age: 20-29 years - 20(8.7%), 30-39 years - 47(20.3%), 40-49 years - 72(31.2%), 50-59 years - 48(20.8%) and >60 years - 44(19.0%) (Table 1).

Table 1.
Age - Gender distribution.

Demographic Variable		Age range (years)	Number	%
Age group	Group 1	20 – 29	20	8.7
	Group 2	30 – 39	47	20.3
	Group 3	40 – 49	72	31.2
	Group 4	50 – 59	48	20.8
	Group 5	> 60	44	19.0
Gender	Male		170	73.6
	Female		61	26.4

Eighty-seven (37.7%) patients had no chronic disease, while 144(62.3%) had comorbidities: hypertension (37[16.0%]), diabetes mellitus (44[19.0%]), a combination of diabetes mellitus with hypertension (32[13.9%]), asthma

(6[2.6%]), hyperlipidemia (4[1.7%]), renal disease (1[0.4%]), and COPD (1[0.4%]) (Table 2). The distribution of comorbidity symptoms in the different age groups is shown in Table 3.

Table 2.
Frequency of comorbidities among the COVID-19 patients.

Comorbidity	n	%
No Chronic Disease	87	37.7 %
Hypertension	37	16.0 %
Diabetes mellitus	44	19.0 %
Diabetes mellitus & Hypertension	32	13.9 %
Asthma	6	2.6 %
Hyperlipidemia	4	1.7 %
Renal disease	1	0.4 %
COPD	1	0.4 %
Multiple chronic diseases, excluding diabetes mellitus and hypertension	19	8.2 %

Table 3.
The distribution of comorbidity symptoms in the different age groups.

Symptoms	Age group / Years										P-value	
	Group 1 (20-29)		Group 2 (30-39)		Group 3 (40-49)		Group 4 (50-59)		Group 5 (>60)			
	n	%	n	%	n	%	n	%	n	%		
Headache	Yes	12	60.0	34	72.3	47	65.3	30	62.5	27	61.4	0.7868
	No	8	40.0	13	27.7	25	34.7	18	37.5	17	38.6	
Fever	Yes	20	100	45	95.7	70	97.2	44	91.7	38	86.4	0.0995
	No	0	0	2	4.3	2	2.8	4	8.3	6	13.6	
Cough	Yes	13	65.0	29	61.7	40	55.6	26	54.2	22	50.0	0.7382
	No	7	35.0	18	38.3	32	44.4	22	45.8	22	50.0	
Fatigue	Yes	6	30.0	22	46.8	31	43.1	16	33.3	14	31.8	0.4086
	No	14	70.0	25	53.2	41	56.9	32	66.7	30	68.2	
Pneumonia	Yes	17	85.0	36	76.6	54	75.0	35	72.9	31	70.4	0.7871
	No	3	15.0	11	23.4	18	25.0	13	27.1	13	29.5	
Short of breath	Yes	14	70.0	28	59.6	50	69.4	27	56.2	24	54.5	0.3978
	No	6	30.0	19	40.4	22	30.6	21	43.8	20	45.4	
Abdominal pain	Yes	8	40.0	20	42.6	32	44.4	20	41.7	19	43.2	0.9965
	No	12	60.0	27	57.4	40	55.6	28	58.3	25	56.8	
Nausea and vomiting	Yes	10	50.0	22	46.8	42	58.3	29	60.4	22	50.0	0.6038
	No	10	50.0	25	53.2	30	42.7	19	39.6	22	50.0	

COVID-19 patients with diabetes in combination with hypertension had a statistically greater PCT level than COVID-19 patients without comorbidities ($P=0.0273$). However, there were no statistically significant differences in the mean PCT level between different age categories ($P=0.7390$) (Fig.1, Table 4)

Table 4.
PCT level among different age groups and comorbidities.

Parameters		PCT	P-value
Age group	Group 1	0.12±.152	0.7390
	Group 2	0.57±1.320	
	Group 3	0.51±1.838	
	Group 4	0.51±1.269	
	Group 5	0.79±2.611	
Comorbidities	Diabetes mellitus & Hypertension (n=32)	1.186 ± 3.212	0.0273*
	Diabetes mellitus (n=44)	0.654 ± 2.057	0.2262
	Hypertension (n=37)	0.292 ± 0.632	0.7948
	Multiple chronic diseases, excluding diabetes mellitus and hypertension (n=19)	0.526 ± 1.064	0.4371
No Chronic Disease (n=87)		0.336 ± 0.939	

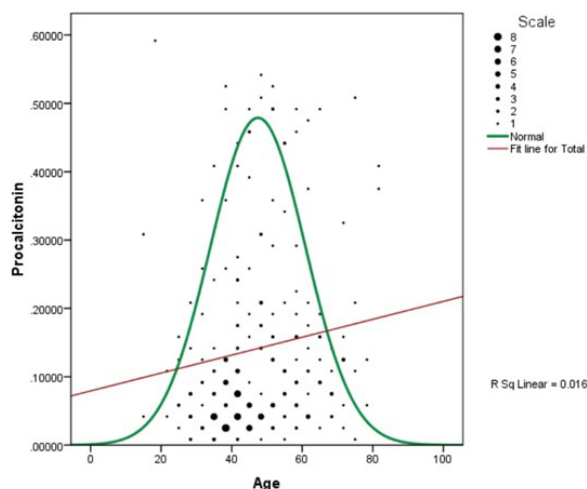


Fig. 2. Weak positive correlation between the age (year) and PCT level ($\mu\text{g/L}$) ($r=0.016$, $P=0.107$)

Discussion

PCT is recommended as a diagnostic biomarker of infection in the febrile population and is associated with

mortality.⁽¹¹⁾ In the current study, 62.3% of patients had comorbidities and 37.7% were without chronic disease. The percentage of male patients was 73.6 % and this was lower than that reported by Zhu et al.,⁽¹²⁾ but like that reported by Yang et al.⁽¹³⁾ (73%) and close to the data reported by Chen et al.⁽¹⁴⁾ Our results showed that COVID-19 patients with diabetes in combination with hypertension had a statistically greater PCT level than COVID-19 patients without comorbidities. However, there were no statistically significant differences in the mean PCT levels between other comorbidities. No previous studies applied this comparison; we advise doing further studies to confirm these findings.

Conclusion

COVID-19 patients with diabetes in combination with hypertension have a statistically greater PCT level than COVID-19 patients without comorbidities. There are no statistically significant differences in the mean PCT level between different age categories. The serum PCT measurement could evaluate the prognosis of the disease in some COVID-19 patients.

Competing Interests

The authors declare that they have no competing interests.

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